

CHAPTER 5

INFILTRATION SYSTEMS

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BMP 5-1 INFILTRATION TRENCH OR BASIN

DEFINITION

A shallow rock or gravel filled trench located at the drip line of roofs or adjacent to other impervious surfaces such as paved driveways and parking areas.

PURPOSE

To infiltrate and percolate runoff from impervious surfaces and to prevent erosion.

APPLICABILITY

Applicable to most sites with impervious surfaces such as roof tops, driveways, parking areas and other paved surfaces; however, since runoff from parking lots and other paved surfaces may contain oils, greases, metals, salts or other pollutants, site specific conditions such as soil characteristics and depth to ground water must be carefully considered to prevent shallow ground water contamination.

PLANNING CRITERIA

Infiltration trenches should be designed and constructed to intercept all runoff from impervious surfaces where erosion may be a problem or where surface runoff must be reduced (as in reducing flows to a storm drain). The sizing of infiltration trenches is dependent on the design storm, soil type and permeability, and the area of impervious surface.

Infiltration trenches placed at the dripline of structures can reduce surface erosion but must be designed so that water infiltrating will not damage foundations or seep into basements. French drains can be used to convey runoff to an infiltration trench away from the structure. Infiltration trenches which are used to drain paved areas, especially parking lots, should incorporate a sediment or grease trap, or replaceable sand filter.

The storage capacity of infiltration trenches decreases as the slope of the trench increases. Infiltration trenches are ineffective on slopes steeper than 15 percent unless modification to the design are made. Trenches on slopes greater than 15 percent can be stepped using baffles or headers in order to provide the design storage capacity.

Where an infiltration trench is located below a disturbed area, a sediment barrier to remove the sediment before it reaches the trench should be installed. Removing sediment from the runoff will increase the efficiency of the infiltration system and reduce maintenance costs.

Infiltration trenches and other infiltration structures should be designed by a qualified professional.

METHODS AND MATERIALS

The location, design and installation of infiltration trenches should be based on site requirements using qualified engineering assistance.

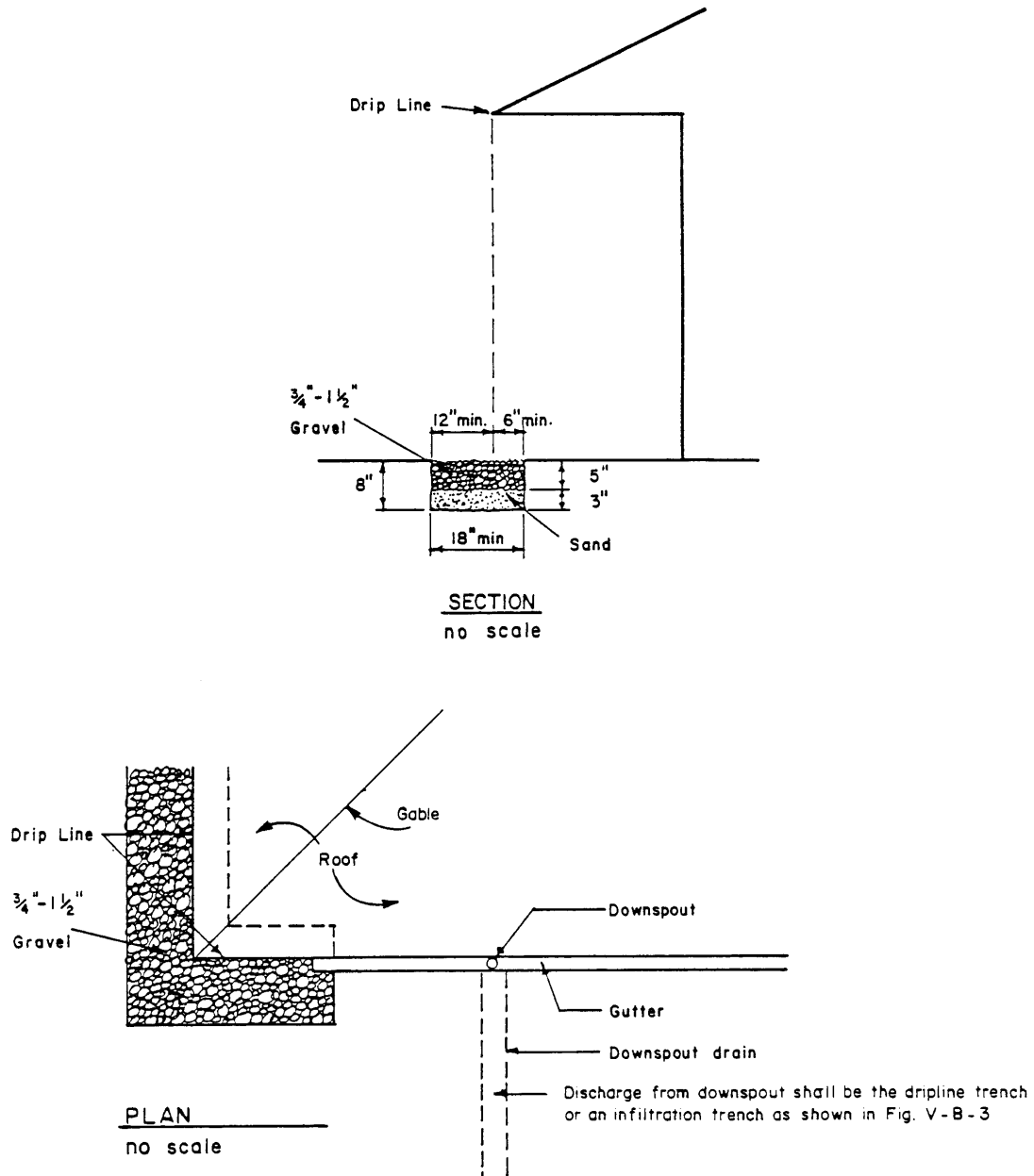
MAINTENANCE

Infiltration trenches require regular maintenance. Accumulated debris and sediment should be removed periodically. The use of the filter cloth for sediment capture can reduce maintenance costs.

EFFECTIVENESS

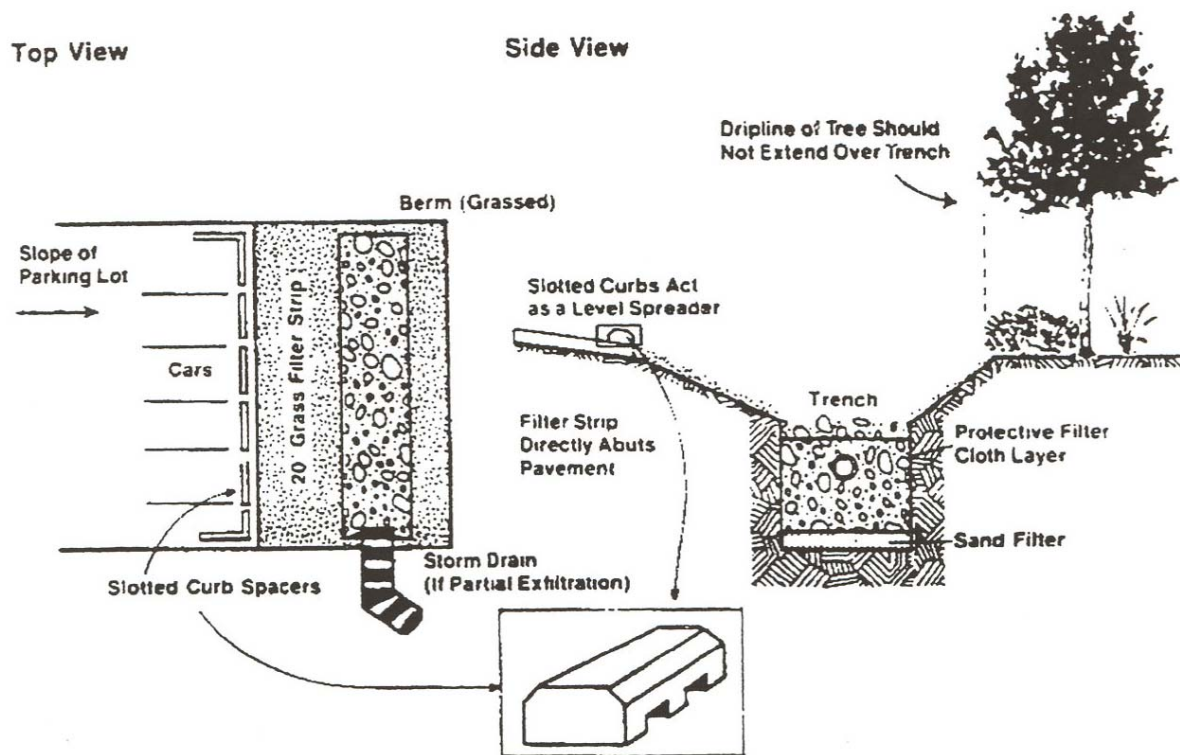
Properly designed and maintained infiltration trenches can reduce surface runoff and erosion. These structures are not effective in areas where shallow ground water is present.

FIGURE 5-1 (Dripline.pcx)
INFILTRATION TRENCH-A



DRIPLINE TRENCH

INFILTRATION TRENCH-B
FIGURE 5-2



BMP 5-2 DRY WELL

DEFINITION

A stone or gravel filled pit, deeper than it is wide.

PURPOSE

To infiltrate and percolate runoff from impervious surfaces with no direct discharge to surface waters.

APPLICABILITY

Applicable to sites requiring additional storage capacity for runoff from impervious surfaces or as an alternative to infiltration trenches on steeper slopes.

PLANNING CRITERIA

The sizing of dry wells is dependent on the design storm, soil type, soil permeability, depth to ground water and/or bedrock, and the area of impervious surface. **Dry wells should be designed by a qualified professional. NOTE: A permit is required for the design, construction and operation of dry wells--permits are not issued for dry wells if the potential for ground water degradation exists.** Contact the Nevada Division of Environmental Protection, Bureau of Water Pollution Control for additional information.

BMP 5-3 FRENCH DRAIN

DEFINITION

A trench containing a perforated drainage pipe surrounded by gravel and located at the dripline of roofs or adjacent to other impervious surfaces, such as driveways and parking areas.

PURPOSE

To infiltrate and collect runoff from impervious surfaces and convey the excess to other infiltration structures.

APPLICABILITY

Applicable on steep slopes where the storage capacity of infiltration trenches is limited and excess water must be conveyed to a different location; also used to convey roof top runoff away from foundations.

PLANNING CRITERIA

The final design of a french drain is dependent on site characteristics and should be completed by a qualified professional.

METHODS AND MATERIALS

A perforated pipe is placed on a layer of small gravel in an excavated trench and backfilled with gravel. Filter cloth can be used to reduce sediment accumulation in the trench.

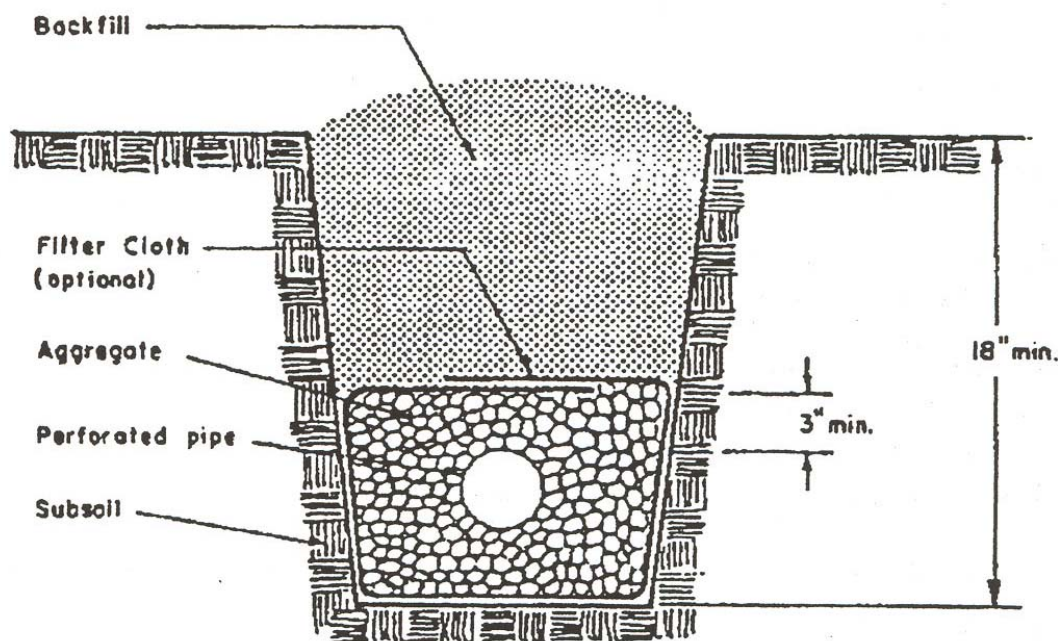
MAINTENANCE

French drains require regular maintenance. Accumulated debris must be removed periodically. The gravel may need to be removed, reworked, or replaced in order to remove accumulated sediments. Filter cloth is useful for preventing clogging.

EFFECTIVENESS

French drains, when properly installed and maintained in accordance with the design criteria, can effectively transport water away from foundations or to alternative sites for infiltration.

FRENCH DRAIN
FIGURE 5-3



SECTION
no scale

BMP 5-4 WETLANDS

DEFINITION

Natural or constructed areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions; wetlands generally include swamps, marshes, bogs and similar areas.

PURPOSE

To improve water quality, remove sediment, reduce soil erosion and prevent flooding.

APPLICABILITY

Natural or constructed wetlands can be utilized where there is a need to 1) reduce pollutants, including nutrients, pesticides, bacteria and sediment, in surface waters; 2) reduce soil erosion along downstream watercourses by slowing overland flow; or 3) reduce flooding by providing temporary storage capacity.

PLANNING CRITERIA

Section 404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers to require and issue permits for dredge and fill activities in the nation's waters which include wetlands, mudflats, vegetated shallows and riffle and pool complexes. Other federal, state and local agencies may also need to be included in the planning and permitting process.

To utilize either natural or man-made wetlands for reducing nonpoint source pollution, a thorough knowledge of the water, soil and plant characteristics is necessary. The wetlands area must be protected from degradation by the pollutants entering the wetland system. A constructed wetlands requires an engineered design which considers site specific criteria.

EFFECTIVENESS

Wetlands and riparian areas can play a critical role in reducing nonpoint source pollution by intercepting surface runoff and subsurface flow; however a definite range of operational conditions must be maintained in order for the wetland system to effectively remove pollutants and to prevent degradation of the system itself. When hydrologic changes or nonpoint source pollutants exceed the natural assimilative capacity of these systems, the wetland areas can become degraded or destroyed.